

## REMARKS

This communication is a full and timely response to the Office Action dated April 30, 2009. Claims 1-3, 5-23, 25-28, and 31-38 remain pending, where claims 4, 24, and 29 were previously cancelled. By this communication, claims 1, 24, and 38 are amended. Support for the amended subject matter can be found, for example, on page 9, lines 16-27 and at page 10, line 20 thru page 11, line 18 of the disclosure.

On page 2 of the Office Action, the title is objected to for allegedly being non-descriptive of the claimed embodiments. Applicants respectfully traverse this objection. However, in an effort to expedite prosecution, the title is amended to address the Examiner's concerns. Withdrawal, therefore, is respectfully requested.

Claims 1, 2, 5, 6, 9-15, 25, and 31-38 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Plante* (U.S. Patent No. 4,655,563) in view of *Clemino* (U.S. Patent No. 4,670,338) in further view of *Fuschetto* (U.S. Patent No. 4,226,507). Applicants respectfully traverse this rejection.

Each of independent claims 1 and 38 broadly recite that a piezo electric actuator or at least one morphing layer is bonded to the mirror substrate. The combination of *Plante*, *Clemino*, and *Fuschetto* fails to disclose every feature recited in Applicant's claims as alleged.

*Plante* does not disclose such a layer or component. Rather, *Plante* uses a number of stacks 18 of piezo elements extending normally of the mirror 10, 14. In particular, the stacks 18 require a further substrate 12 to provide a structure against which the stacks can generate force to deform the mirror. Thus the combination of *Plante*'s parts 10, 14, and 18 do not constitute a structure which generates

deformation within itself, i.e., it is not self-deforming. The only self-contained self-deforming structure disclosed by *Plante* is the combination 10, 14, 18, and 12. However, there are no flexible passive supports for this structure, as the substrate 12 is supported only by non-compliant actuators 22, 24, or 29. Even assuming *arguendo* that the Examiner's interpretation that *Plante's* features 10, 14, and 18 alone constitute a self-deforming mirror, the reliance on the use of epoxy cement to fix each stacks 18 to its respective top and bottom buttons 16 can only be improperly gleaned from Applicants' disclosure through hindsight reasoning, and is technically unsound.

Given the guidance provided in *Plante*, one of ordinary skill would understand that the deformation of the mirror surface 14 by the piezoelectric stacks 18 must be closely controlled and accurate to tolerances of tenths of microns. Therefore, no lost or uncontrolled relative motion can be tolerated between each stack and its respective top and bottom button 16. This design can only be achieved if the epoxy adhesive provides a rigid bond, and the skilled reader would therefore take it as axiomatic that only a rigid-setting adhesive would be suitable. Indeed *Plante's* use of the term "cement" (col. 4, line 43) implies a rigid joint, and furthermore the mention of brazing as an alternative fixing method (col. 3, line 20) is instructive: brazing provides a rigid joint, not a flexible one. Because *Plante* does not disclose or suggest the desire to use a flexible joint, or the desire of any degree of flexibility in the joint, otherwise this reference cannot reasonably be interpreted to disclose Applicants' claimed features.

*Clemino* discloses that epoxy adhesives come in rigid-setting and flexible-setting variants adds nothing to the teaching of *Plante*. As demonstrated above, it is

implicit in *Plante* that his epoxy adhesive is of the rigid-setting type. The teaching of *Clemino* would not cause the skilled reader of *Plante* to adopt a flexible type of adhesive as alleged. Rather, Applicants submit that given the combination one of ordinary skill could only expect that the resulting structure would inoperable. In fact, if the teaching of *Clemino* were somehow integrated into the design of *Plante*, Applicant's submit that *Plante* would be rendered unsatisfactory for achieving its intended purpose, namely the flexible support structure would not be a mounting for a self-deforming mirror as required by claim 1, but would instead be within the structure of that mirror (the bonds to the buttons 16 are within the only disclosed self-deforming structure 10, 14, 18, 12, as discussed above).

*Fuschetto* is applied for its alleged teaching of a mirror having a piezoelectric actuator bonded to the mirror substrate the passive support is attached to the piezoelectric actuator. *Fuschetto*, however, does not cure the deficiencies of the *Plante-Clemino* combination as alleged. *Fuschetto* discloses a self-deforming mirror comprising a mirror 11 to the underside of which are attached piezo actuators 13, 15, 17 connected to a central floating hub 19. The mirror deforms itself in a self-contained manner by expansion or contraction of the actuators, which are rod-like rather than in the form of a layer. The self-deforming mirror moreover is not supported by a flexible passive support: the hub 19 is mounted on a central and clearly rigid post 29. Applicant is not entirely clear on exactly what component of *Fuschetto* the Examiner considers to constitute a flexible passive support. However, if it is the flexure blocks 21, 23, then once again these are within the self-deforming mirror structure, and are not part of the external support for that structure. The

flexure blocks also transmit the forces required to deform the mirror, and thus are not "passive".

Both claims 1 and 38 broadly recite that deformation of the mirror structure is to be achieved without the application of forces to the passive support structure. *Plante*, *Clemino*, and *Fuschetto*, even under the broadest reasonable interpretation of the claims, fail to disclose or suggest each feature, and /or the combination of features recited in Applicant's claims. Accordingly, a *prima facie* case of obviousness has not been established.

Regarding claim 34, the Examiner alleges that *Plante* discloses a structure in which support elements are disposed in equi-spaced relationships in a circular arrangement as recited in Applicants' claim. Applicants' disagree. While *Plante* discloses that a bottom sheet of the mirror includes plural buttons 16 that support actuators 18, there is no teaching or suggestion that the placement of the actuators is in a "circular arrangement" as recited in the claims. In fact, the Examiner's annotation of Fig. 1 of *Plante* is a misrepresentation of and speculative interpretation of this reference.

Based on the foregoing discussion, withdrawal of the rejection under 35 U.S.C. §103 is respectfully requested.

**CONCLUSION**

Based on the foregoing amendments and remarks, claims 1-3, 5-23, 25-28, and 31-38 are deemed allowable and this application is in condition for allowance. In the event any issues adverse to allowance remain, the Examiner is invited to contact Applicants' representative identified below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: October 30, 2009

By: /Shawn B. Cage/  
Shawn B. Cage  
Registration No. 51522

**Customer No. 21839**  
703 836 6620